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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/775,106	02/01/2001	Gerard A. Mourou	30275/939A	4544

4743 7590 05/30/2007

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EXAMINER	
EVANS, GEOFFREY S	
ART UNIT	**PAPER NUMBER**
1725	

MAIL DATE	DELIVERY MODE
05/30/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/775,106	MOUROU ET AL.	
	Examiner	Art Unit	
	Geoffrey S. Evans	1725	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 December 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *46-105* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *46-105* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *20060324*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. The reissue oath/declaration filed with this application is defective (see 37 CFR 1.175 and MPEP § 1414) because of the following: The reissue oath/declaration filed with this application is defective because it fails to identify at least one error which is relied upon to support the reissue application. See 37 CFR 1.175(a)(1) and MPEP Section 1414. Applicant has submitted copies of the reissue declaration from the parent reissue application. This declaration is no longer applicable to the errors that are being corrected in this divisional. While the specific errors listed were corrected in the divisional, other errors are now being addressed in this application. Applicant needs to specify the errors that are now being corrected. In accordance with 37 CFR 1.175(b)(1), a supplemental reissue oath/declaration under 37 CFR 1.175(b)(1) must be received before this reissue application can be allowed.

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 46-52,55,57,58,62, and 63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sherman et al. in the article "Transient response of metals to ultrashort pulse excitation" in view of Nishikawa et al. in Japan Patent No. 62-144,893. Sherman et al. discloses a laser induced breakdown (LIB) of copper and molybdenum (a non-biologic material)(see page 1115, column 1, line 58 -column 2, line 2 and page 116, paragraph 1). Figures l(a)-(b) of Sherman et al. specifically depicts the change in slope, i.e. no longer proportional to the square root of the pulse width. Page 116, column 1 of Sherman et al. discloses that there are two distinct regions, the short pulse region and the long pulse region. The short pulse region, less than 500 picoseconds, is disclosed as having a damage threshold that is independent of pulse duration. The long pulse regions, greater than 1 nanosecond, are described as having a damage threshold that scales with T1~2 (page 1116, column 1, paragraph 1). Additionally, Sherman discloses using pulse durations of 2.5 picoseconds (2500 fs) with pulse energy of 1 mJ (Page 115, column 1, last full paragraph). Sherman et al. specifically states that the short pulse region is independent of the pulse duration and has a higher damage threshold than anticipated and shows use of pulses below the characteristic pulse width (Figure 1 and page 1116, column 1, paragraph 1). Sherman discloses the use of a laser operating in the claimed pulse width region, i.e. at or below the fluence breakdown threshold for the particular material being operated on within the claimed ranges (Figure

1 and page 1116, column 1, paragraph 1). The laser pulses of Sherman et al. must be directed at the workpiece for the workpiece to absorb the energy from the laser pulses and to successfully ablate material. With respect to claim 47, Sherman et al. discloses using a CO_2 laser with a wavelength of 9.3 microns and a resolution of 1 micron (see page 1115, column 1, paragraph 6 to column 2, paragraph 2). The resolution has a maximum dimension of 1 micron is less than the size of the wavelength of the laser beam (9.3 microns); the limitations of claim 47 are met. Since Sherman et al. and the instant application are both performing laser induced breakdown processes with similar operating parameters, it is inherent that the breakdown disclosed by Sherman et al. includes changes caused by one or more or ionization, free electron multiplication, dielectric breakdown, plasma formation, and vaporization. Sherman et al. does not disclose that only part of the beam causes laser ablation, however Sherman et al. discloses that the laser beam is gaussian (see page 1115, column 2,lines 1-6) and that the laser beam is focused. Nishikawa et al. teach that when using a laser beam that has a gaussian shape it will only ablate (evaporate) materials in the center part of the beam with a fluence level over a threshold value (see abstract and figure 1). It would have been obvious to adapt Sherman et al. in view of Nishikawa et al. to provide this to more accurately laser process the workpiece.

5. Claims 46, 48,49,50, 51/46, 51/48, 51/49, 51/50, 55/46,55/48,55/49,55/50, 57/46, 57/48, 57/49, 57/50, 58/46, 58/48, 58/49, 58/50, 62/55/46, 62/55/48,62/55/49, 62/55/50, 63/46,63/48,63/49,63/50,68/46, 68/48,68/49, 68/50, 70/46,70/48,70/49,70/50, 71/46,71/48,71/49,71/50, 73/46,73/48,73/49,73/50, and 78 are rejected under 35 U.S.C.

102(b) as being anticipated by Schwab et al. in the article "Femtosecond-Excimer Laser Patterning of YBa2Cu307 Films" in view of Nishikawa et al. in Japan Patent document No. 62-144,893. Schwab et al. discloses laser ablation of a non-biologic material (a superconductor) with 500 femtosecond laser pulses with a fluence of 0.2 Joules per square centimeter at the workpiece surface. Since there is no discernible heat effected zone (see figure 2), inherently the wavelength of the laser pulses must be at or equal to the pulse width at which laser induced breakdown becomes essentially accurate at a corresponding fluence. Since Schwab et al. and the instant application are both performing laser induced breakdown processes with similar operating parameters, it is inherent that the breakdown disclosed by Sherman et al. includes changes caused by one or more or ionization, free electron multiplication, dielectric breakdown, plasma formation, and vaporization. Schwab et al. does not disclose configuring the laser beam such that a first area within a spot size of the beam exceeds a breakdown threshold and such that a second area within the spot size does not exceed the breakdown threshold. Nishikawa et al. teach using a lens to configure the beam such that a first area within a spot size of the beam exceeds a breakdown threshold and such that a second area within the spot size does not exceed the breakdown threshold (see figure 1). It would have been obvious to adapt Schwab et al. in view of Nishikawa et al. to provide this to more accurately laser process the workpiece.

6. Claims 46,48-50,51/46,51/48,51/49, 51/50,52/46,52/48,52/49, 52/50, 55/46, 55/48, 55/49,55/50,57/46,57/48,57/49,57/50,58/57/46,58/57/48,58/57/49,58/57/50, 62/46,62/48,62/49,62/50,63/46,63/48,63/49,63/50, 65/46,65/48,65/49,65/50,

68/46,68/48,68/49,68/50,69/46,69/48,69/49,69/50,71/46,71/48,71/49,71/50,72/46,72/50, 73/46,73/48,73/49,73/50, and 78 are rejected under 35 U.S.C. 102(e) as being anticipated by Alexander in U.S. Patent No. 6,489,589 B1 in view of Nishikawa et al. in Japan Patent document No. 62-144,893. Alexander discloses (see column 9,line 63 to column 10,line 38) laser machining stainless steel, gold, copper, iron, nickel, titanium, silicon, and diamond, which is far less than a pulse width of 10 picoseconds which is disclosed by the instant application as the point at which machining is essentially accurate with these materials. Since Alexander discloses a pulse width shorter than 10 picoseconds inherently under Applicant's discovered law of nature (the log-log relationship between the fluence threshold at which breakdown occurs versus laser pulse width, the relationship exhibiting a distinct change in slope with respect to decreasing pulse width to a nearly constant value) the laser pulse ablation of Alexander must also be subject to the same law of nature. See EMI Group North America v. Cypress Semiconductor Corp., 60 USPAQ 1423,1430 (CAFC 2001), which states "Recitation of a law of nature does not distinguish a claim from prior art. Funk Bros. Seed Co. V. Kalo Inoculatn Co., 333 U.S. 127,130 (1948) ("[M}anifestations of laws of nature {are} free to all men and reserved exclusively to none. He who discovers a hitherto unknown phenomenon of nature has no claim to monopoly of it which the law recognizes.")'. Similarly Alexander's pulse width must be below the pulse width at which the laser induced breakdown becomes essentially accurate and the point at which the size of the feature is not limited by thermal diffusion and the pulse width of Alexander is sufficiently short that the affected area is substantially determined solely by the beam

shape and fluence in relation to the threshold for laser induced breakdown. Alexander does not disclose configuring the laser beam such that a first area within a spot size of the beam exceeds a breakdown threshold and such that a second area within the spot size does not exceed the breakdown threshold. Nishikawa et al. teach using a lens to configure the beam such that a first area within a spot size of the beam exceeds a breakdown threshold and such that a second area within the spot size does not exceed the breakdown threshold (see figure 1). It would have been obvious to adapt Alexander in view of Nishikawa et al. to provide this to more accurately laser process the workpiece. Regarding claims 65/46,65/48,65/49,65/50, Alexander discloses in column 10,lines13-14" ... the laser beam may be oscillated to cover a wider area." which is considered to mean scanning of the laser beam to the workpiece.

7. Claims 47, 51/47,52/47,55/47,56,57/47,58/57/47, 59,60,61,62/47,63/47, 65/47,66, 68/47,69/47,70/47,71/47,72/47,73/47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alexander in U.S. Patent No. 6,489,589 B1 in view of Nishikawa et al. in Japan Patent No. 62-144,893 and Lai in U.S. Patent No. 5,984,916. Nishikawa et al. teach using a lens to configure the beam such that a first area within a spot size of the beam exceeds a breakdown threshold and such that a second area within the spot size does not exceed the breakdown threshold (see figure 1). Lai as shown in figure 5 teaches creating an interaction zone that is smaller than the wavelength of the laser beam beneath the surface of the workpiece. It would have been obvious to adapt Alexander in view of Nishikawa et al. and Lai to provide this to more precisely shape the area being cut by not using the entire beam to laser ablate the

workpiece and to create an interaction zone smaller than the wavelength of the laser beam to decrease the size of the part of the material that has material properties change.

8. Claims 64/46,64/48,64/49, and 64/50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alexander in view of Nishikawa et al. as applied to claims 46,48,49, and 50 above, and further in view of Mourou et al. in U.S. Patent No. 5,235,606. Mourou et al. (606) teach generating a short optical pulse by stretching the pulse in time, amplifying the pulse, and recompressing the amplified pulse. It would have been obvious to adapt Alexander in view of Nishikawa et al. and Mourou et al. to provide this to create a short high peak power pulse for laser machining.

9. Claim 64 /47 is rejected under 35 U.S.C. 103(a) as being unpatentable over Alexander in view of Nishikawa et al. and Lai as applied to claim 47 above, and further in view of Mourou et al. in U.S. Patent No. 5,235,606. Mourou et al. (606) teach generating a short optical pulse by stretching the pulse in time, amplifying the pulse, and recompressing the amplified pulse. It would have been obvious to adapt Alexander in view of Nishikawa et al., Lai and Mourou et al. to provide this to create a short high peak power pulse.

10. Claims 53/52/46, 53/52/48, 53/52/49, 53/52/50, 54/53/52/46, 54/53/52/48, 54/53/52/49, 54/53/52/50, 79, and 80 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alexander in view of Nishikawa et al. as applied to claims 52/46,52/48,52/49,52/50 and further in view of Wojnarowski et al. in U.S. Patent No. 5,104,480. Wojnarowski et al. teaches laser machining gold (see column 7,line 19)

above a substrate of glass (see column 6,line 64) to create a conductive pattern for an integrated circuit. It would have been obvious to adapt Alexander in view of Nishikawa et al. and Wojnarowski et al. to provide this to create an integrated circuit on the substrate.

11. Claims 53/52/47,54/53/52/47,68/47 rejected under 35 U.S.C. 103(a) as being unpatentable over Alexander in view of Nishikawa et al. and Lai as applied to claim 47 above, and further in view of Wojnarowski et al. in U.S. Patent No. 5,104,480. Wojnarowski et al. teaches laser machining gold (see column 7,line 19) above a substrate of glass (see column 6,line 64) to create a conductive pattern for an integrated circuit. It would have been obvious to adapt Alexander in view of Nishikawa et al., Lai, and Wojnarowski et al. to provide this to create an integrated circuit on the substrate.

12. Claims 67,74-77,81-105 contain subject matter allowable over the prior art or record, but are rejected as being based upon a defective reissue declaration under 35 U.S.C. 251 as stated in the first paragraph of this office action.

13. Applicant's arguments filed 27 December 2006 have been fully considered but they are not persuasive. The newly cited Nishikawa et al. reference discloses having a first spot size within the beam exceeding the fluence threshold for laser ablation.

14. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Gaukroger in U.S. Patent No. 5,194,711 discloses in figure 5b that the edges (shaded region) of the gaussian laser beam cannot cut the workpiece (see column 3,lines 29-32). Funami et al. in U.S. Patent No. 5,055,653 in figure 13B shows the relationship between the allowable machining area and the laser beam cross sectional intensity (see column 2, lines 5-16). Shirasu et al. in Japan Patent No. 63-36,992 discloses laser optics for configuring the laser beam to machine a desired region. Egashira in Japan Patent No. 2-295,688 as shown in figure 2 uses the inner laser beam for cutting and the outer laser beam for melting.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Geoffrey S. Evans whose telephone number is (571)-272-1174. The examiner can normally be reached on Mon-Fri 6:30AM to 4:00 PM, alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on (571)-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Geoffrey S Evans
Primary Examiner
Art Unit 1725

GSE